

FIG. 1

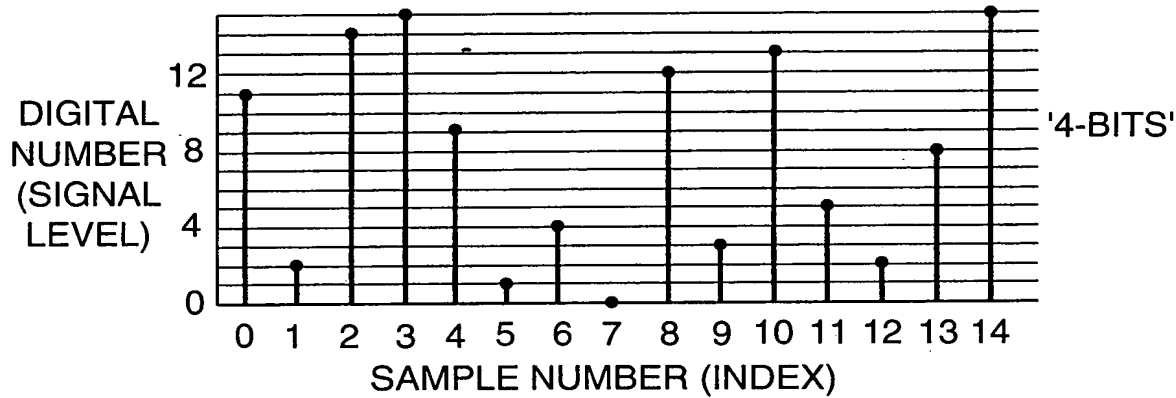


FIG. 4

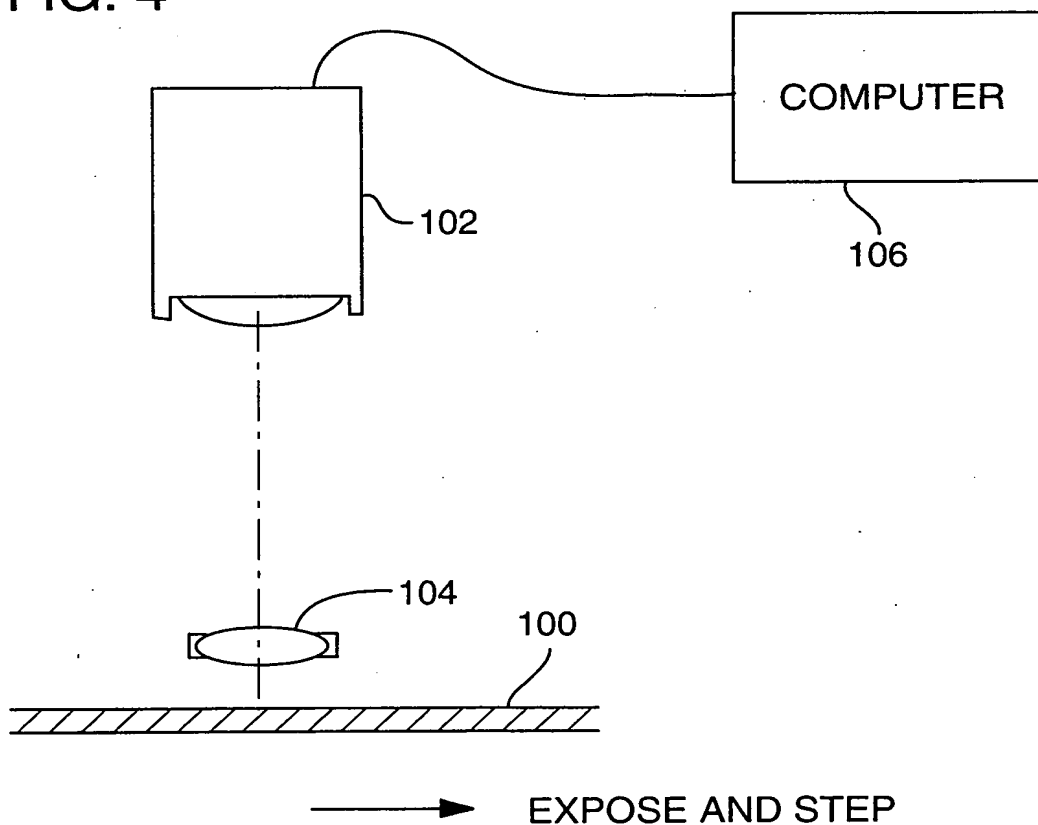


FIG. 2

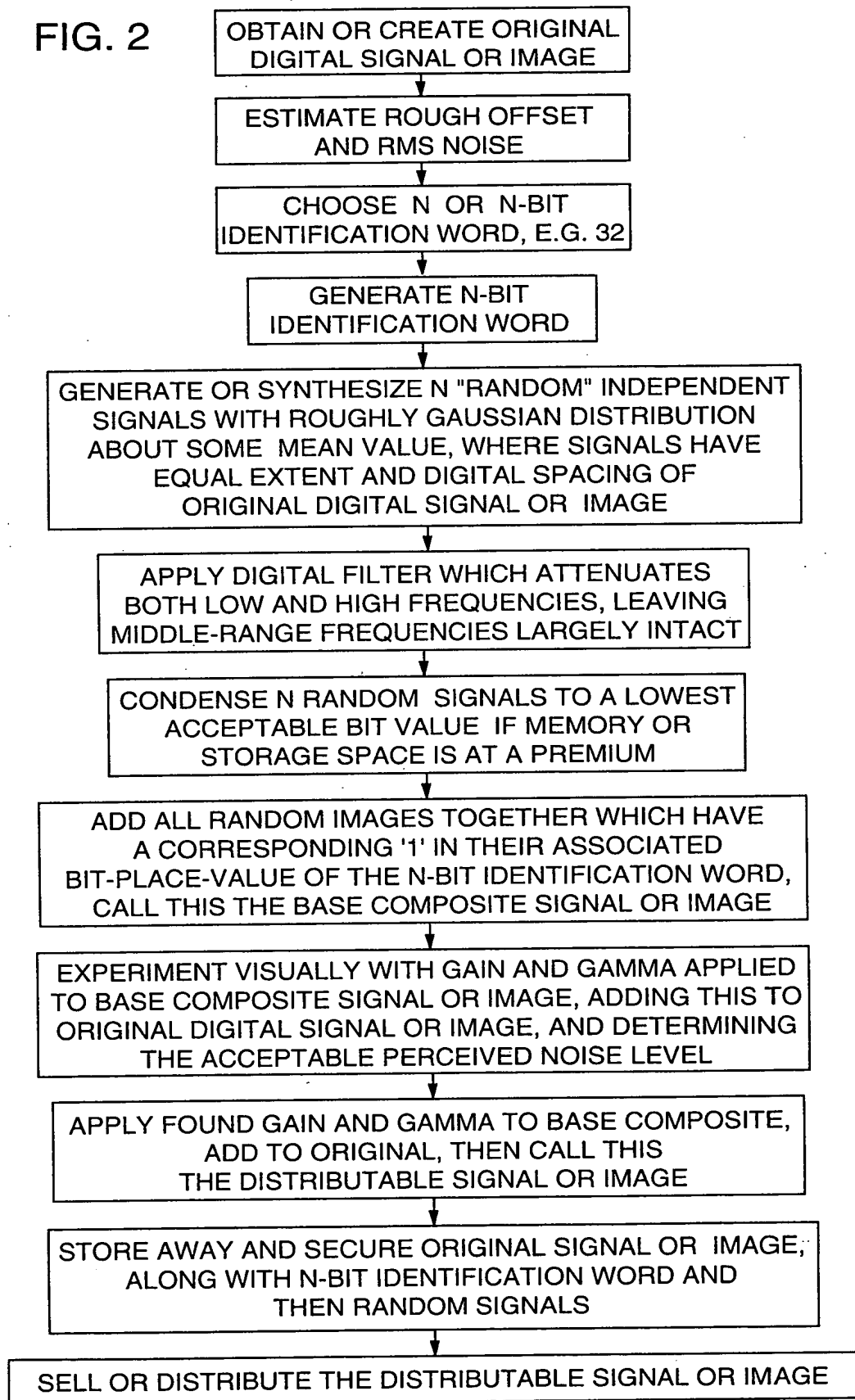
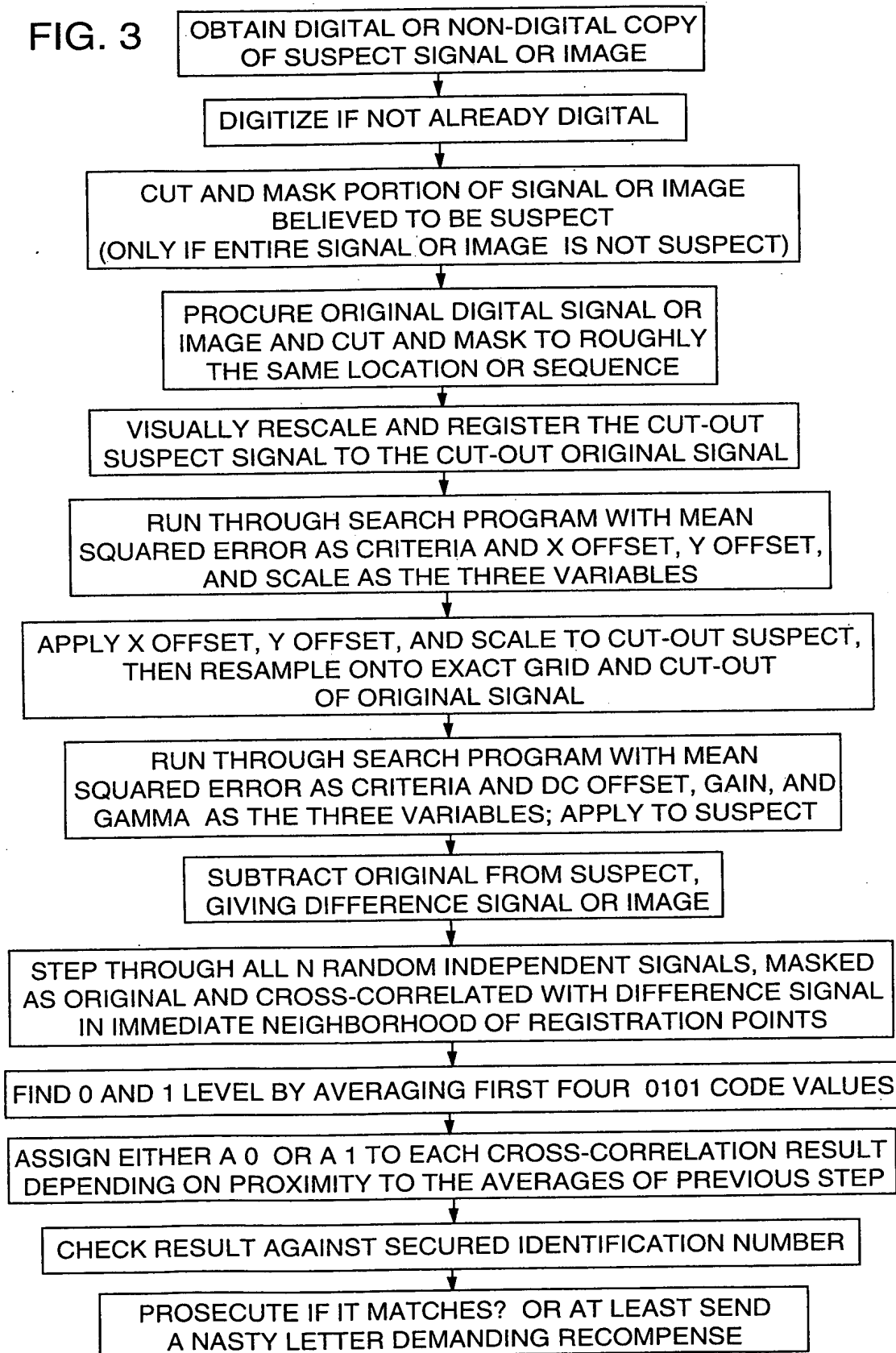


FIG. 3



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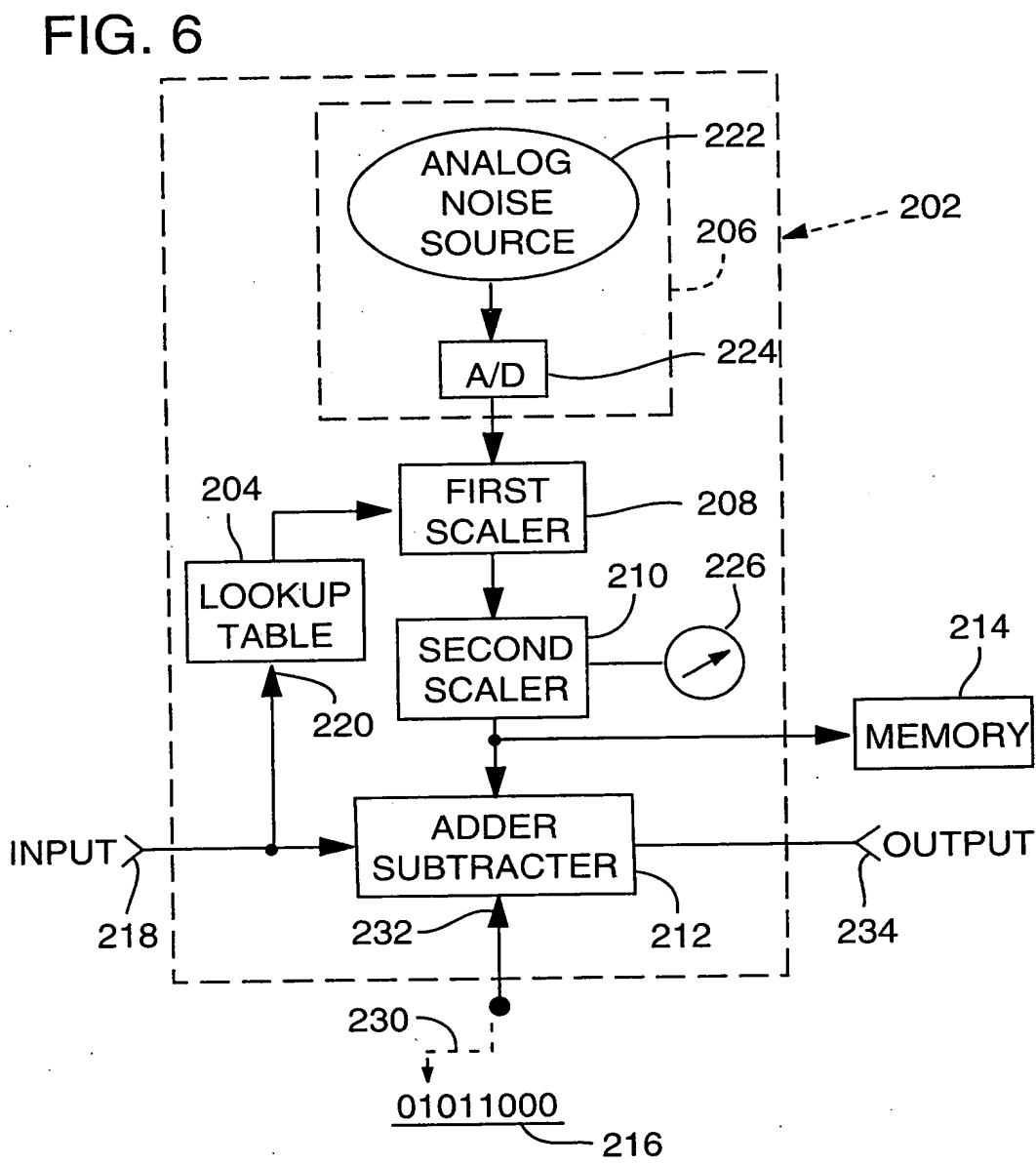


FIG. 6

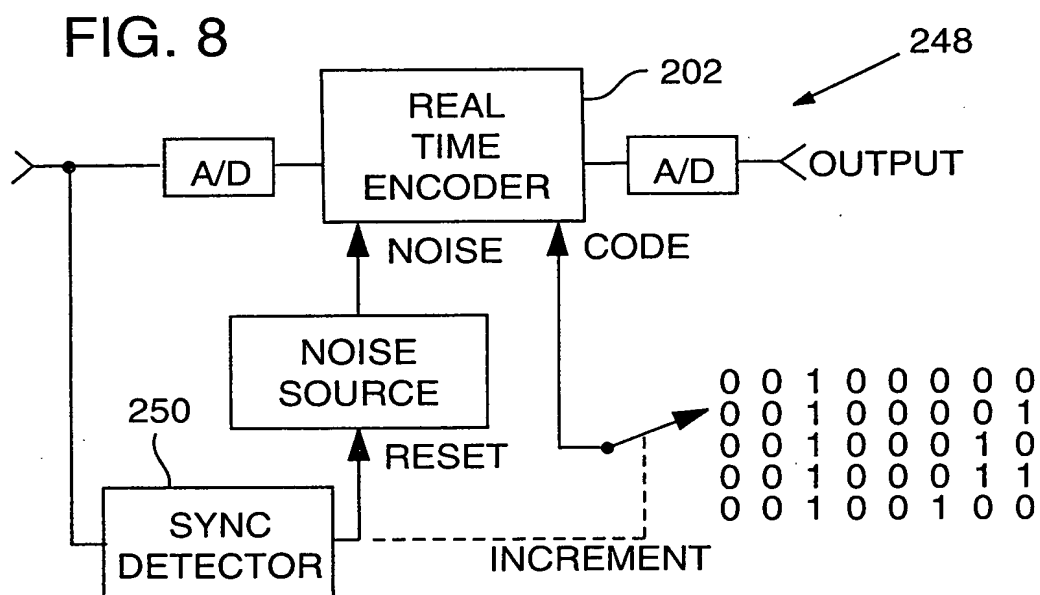
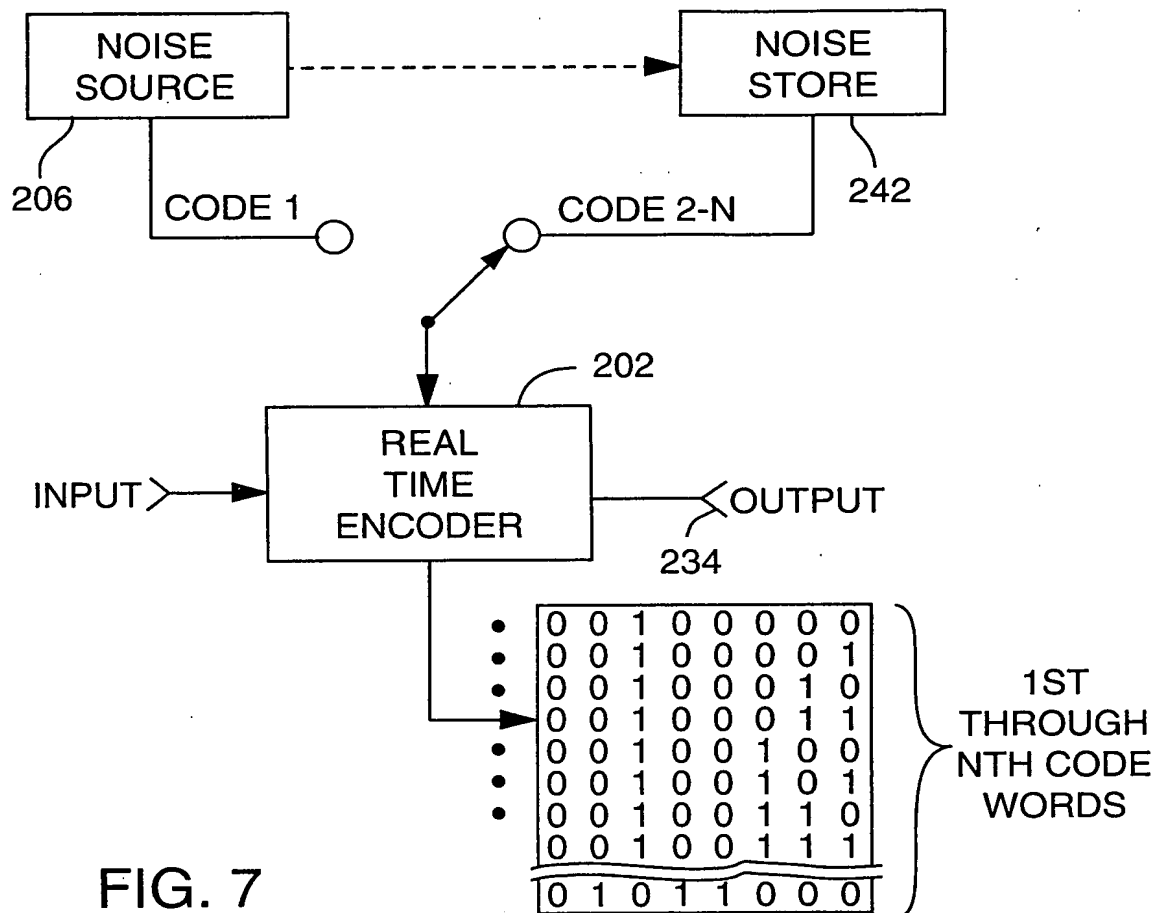


FIG. 9A

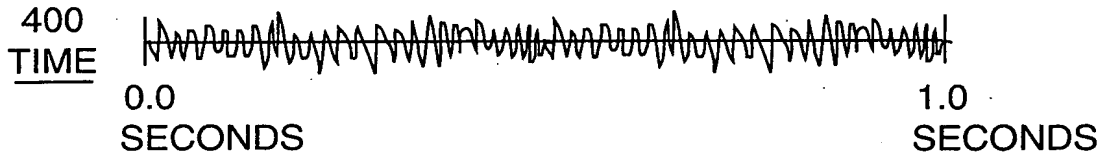


FIG. 9B

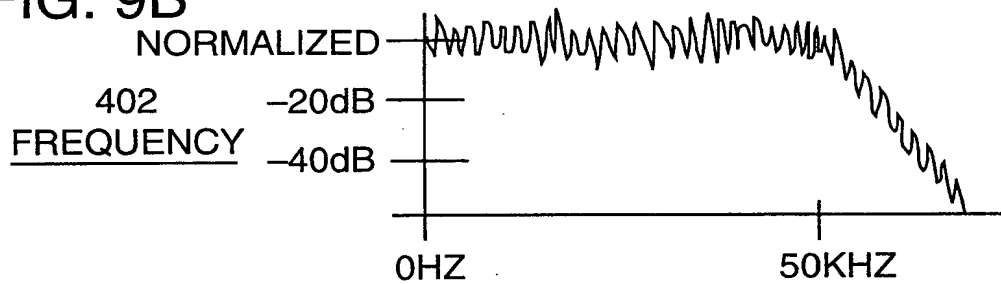


FIG. 9C

BORDER
CONTINUITY
404

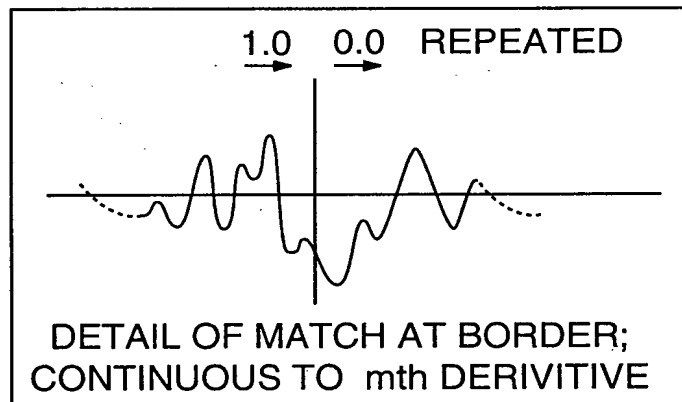


FIG. 10

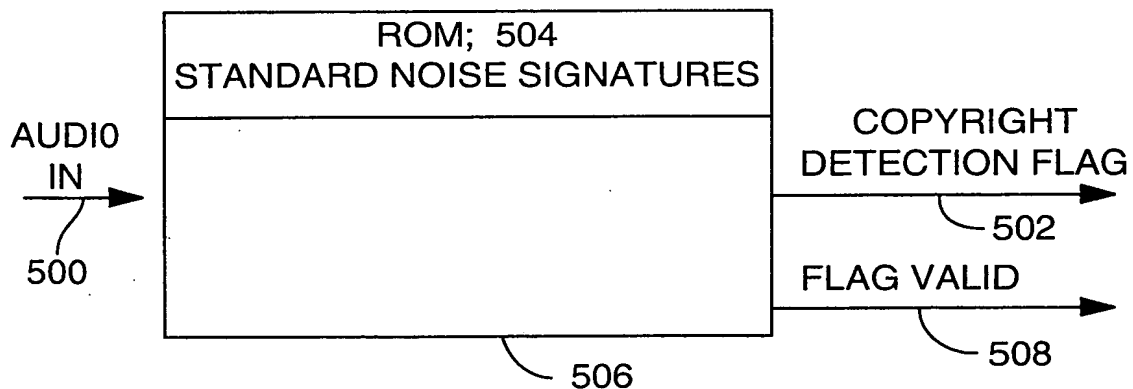


FIG. 11

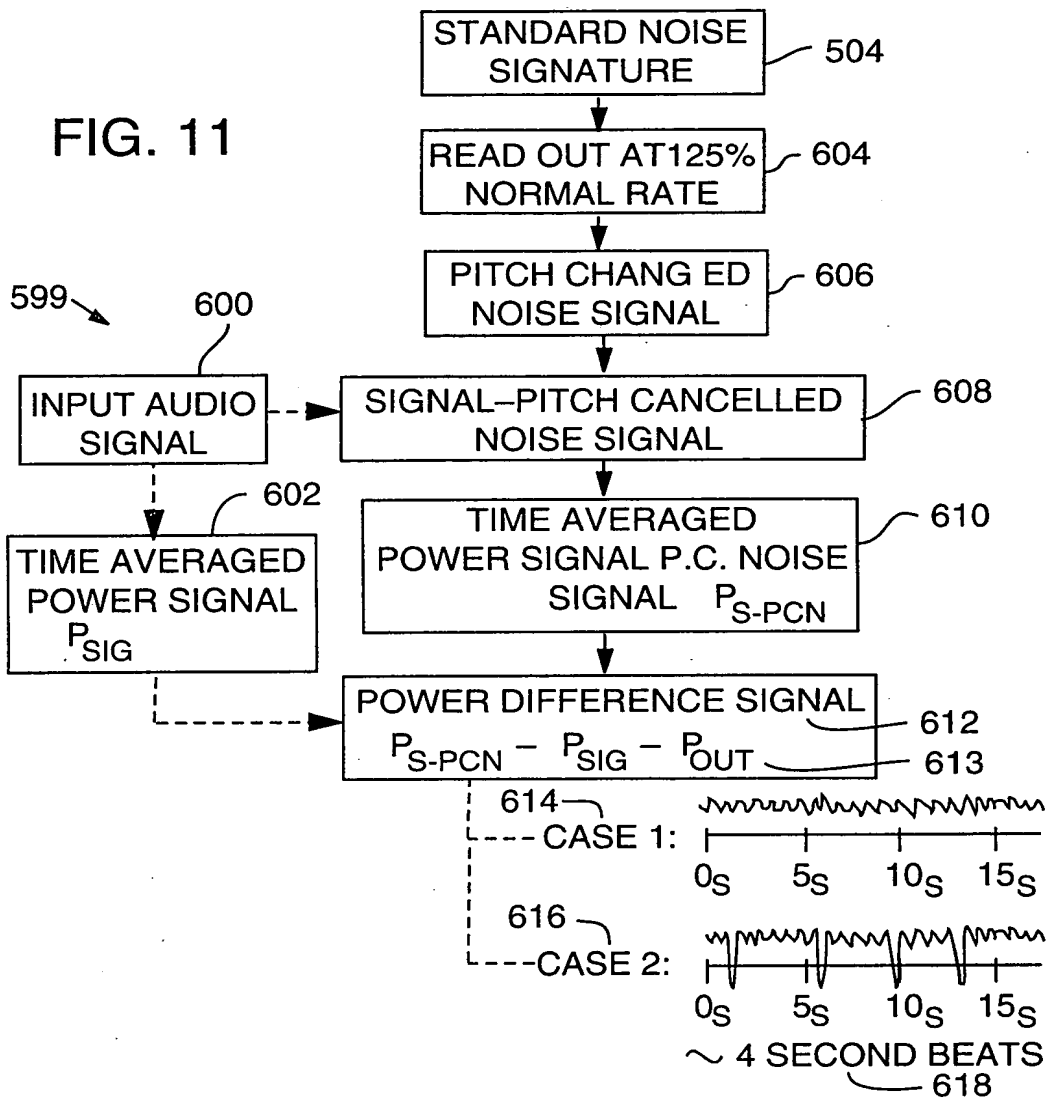


FIG. 12

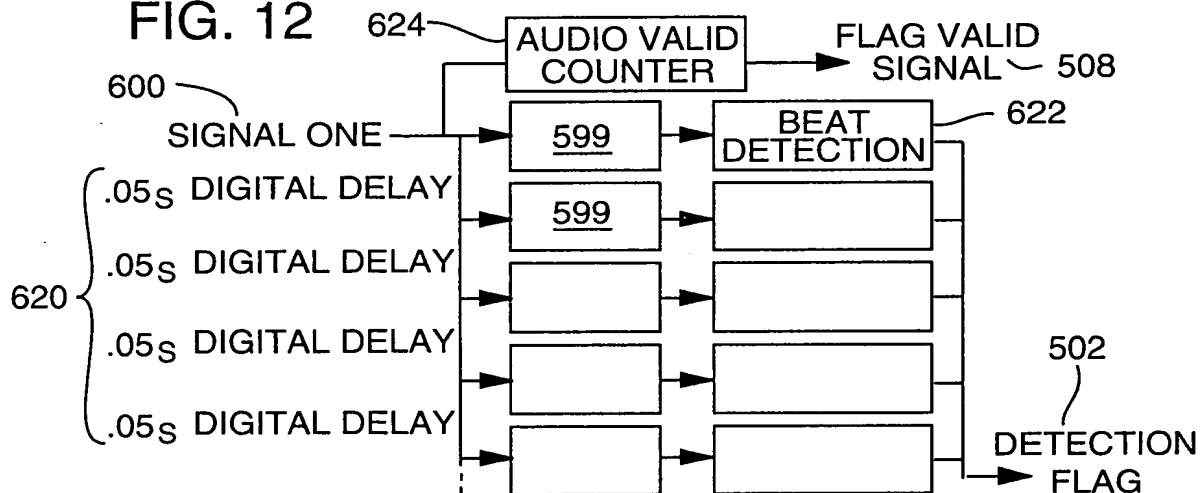
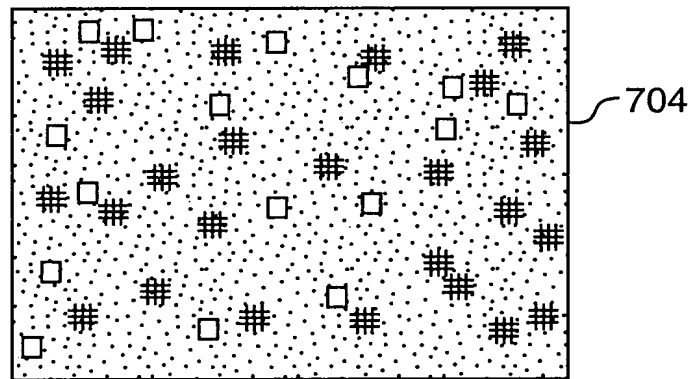
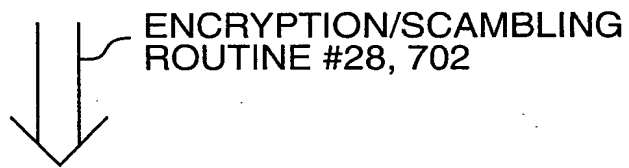
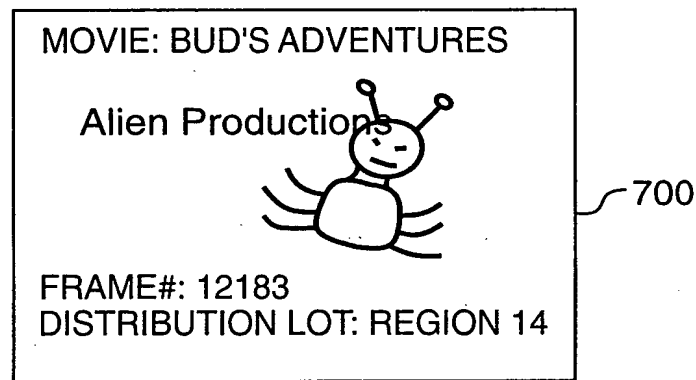
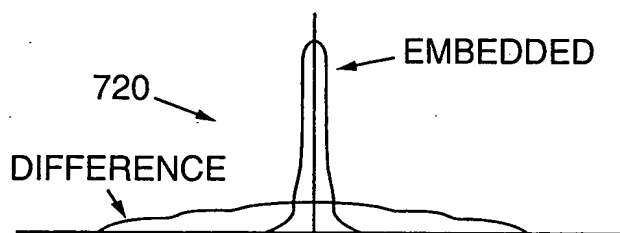


FIG. 13

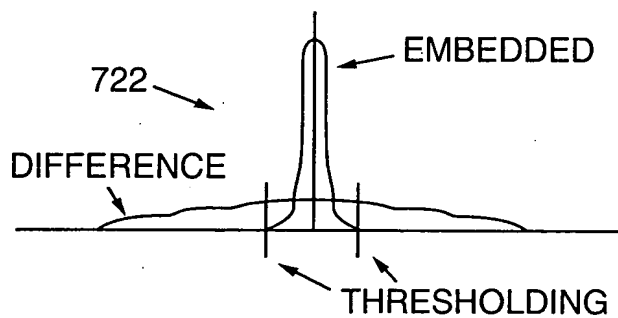


PSEUDO-RANDOM MASTER SNOWY IMAGE
(SCALED DOWN AND ADDED TO FRAME 12183)

FIG. 14



MEAN-REMOVED HISTOGRAMS OF
DIFFERENCE SIGNAL AND KNOWN EMBEDDED
CODE SIGNAL



722, MEAN-REMOVED HISTOGRAMS OF
FIRST DERIVATIVES (OR SCALAR GRADIENTS
IN CASE OF AN IMAGE)

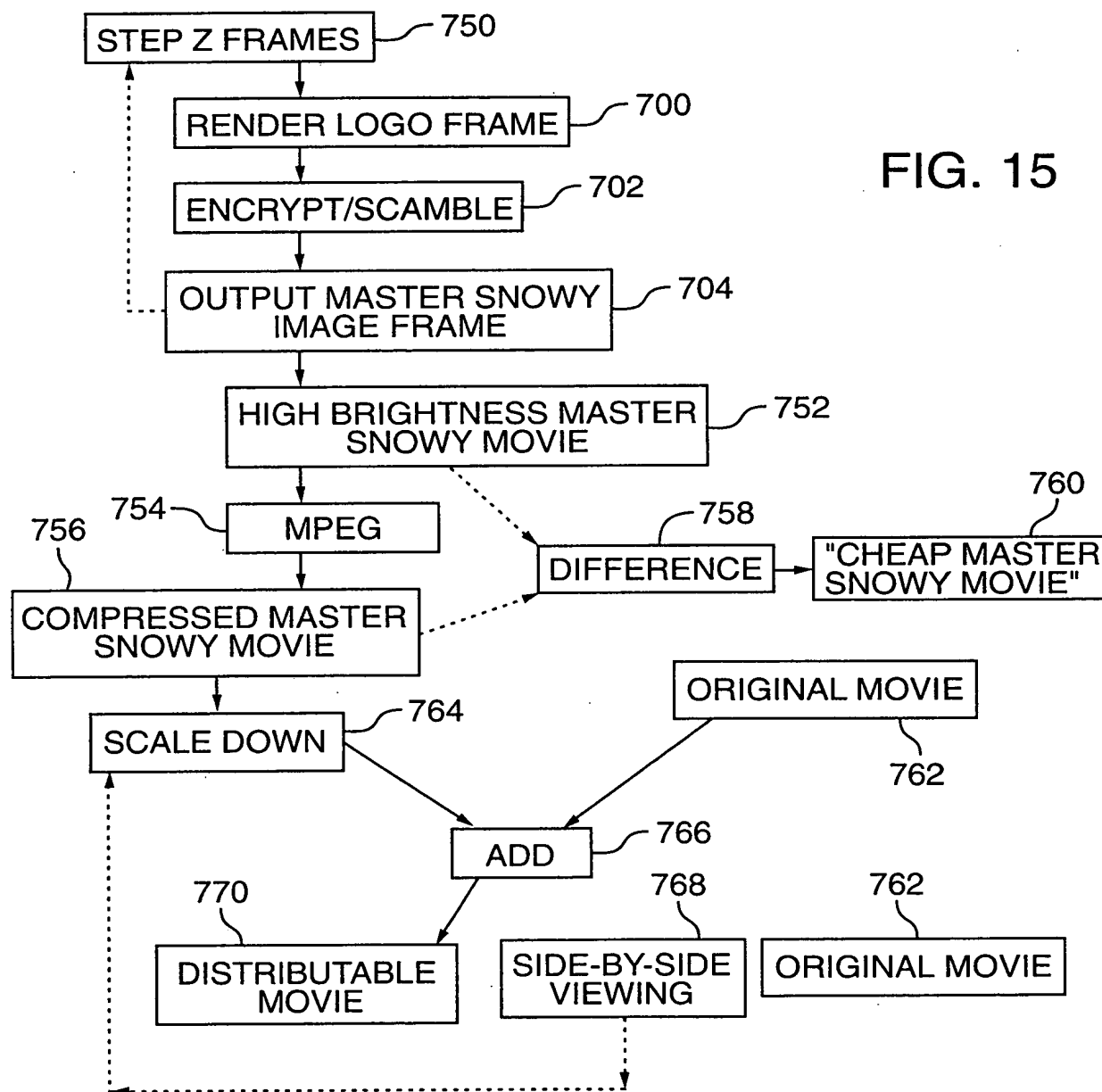


FIG. 16

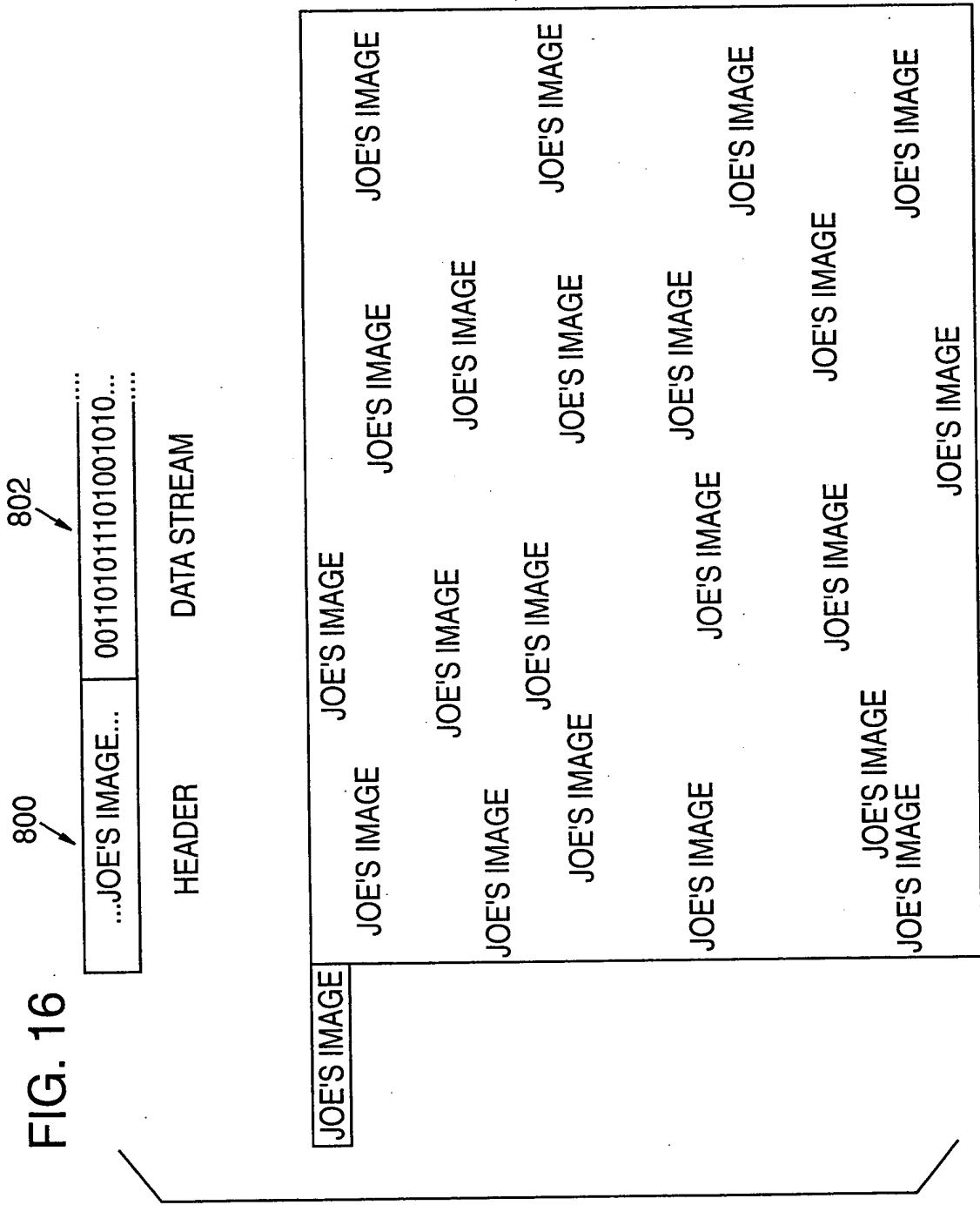
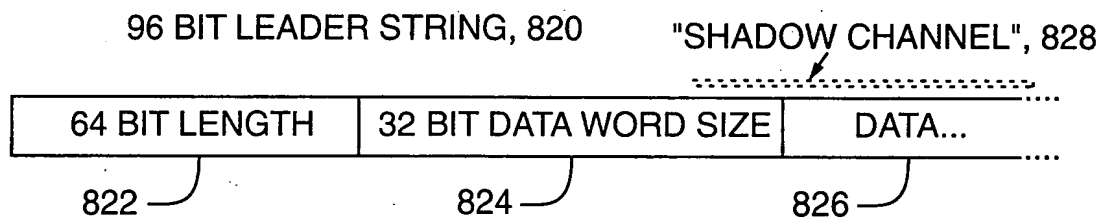


FIG. 17



UNIVERSAL EMPIRICAL DATA FORMAT

FIG. 18

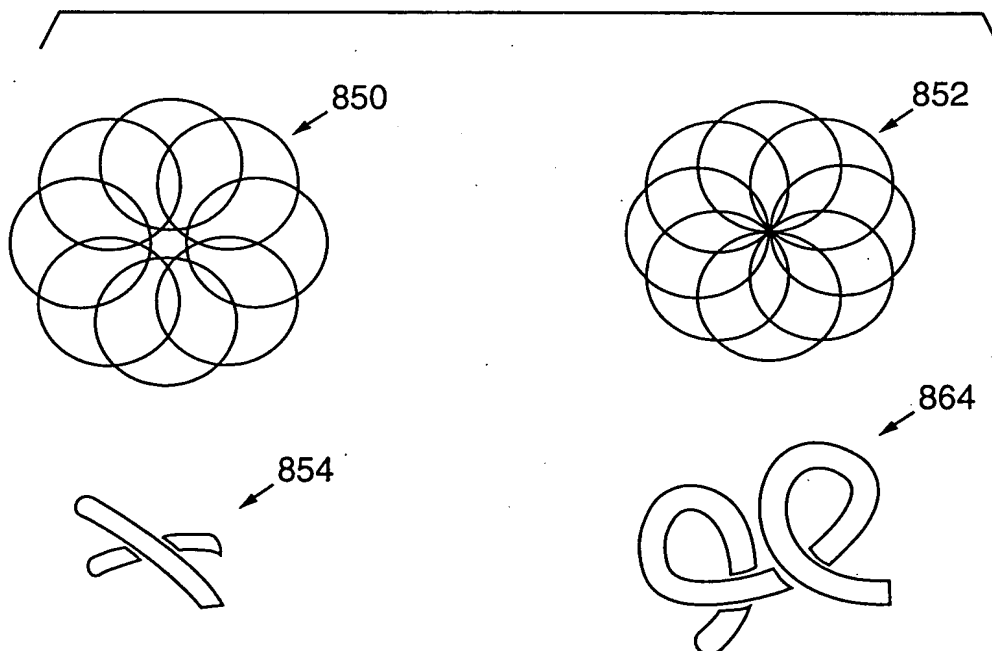
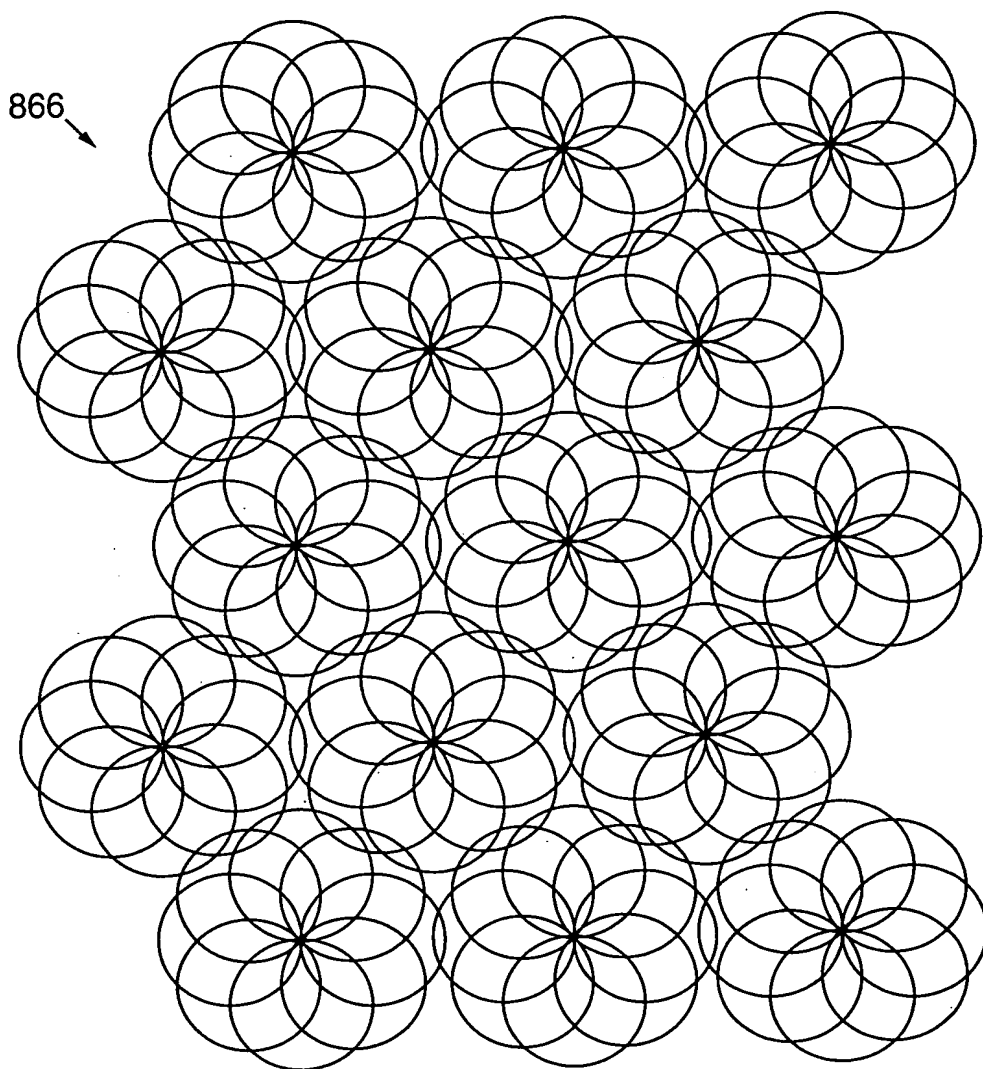
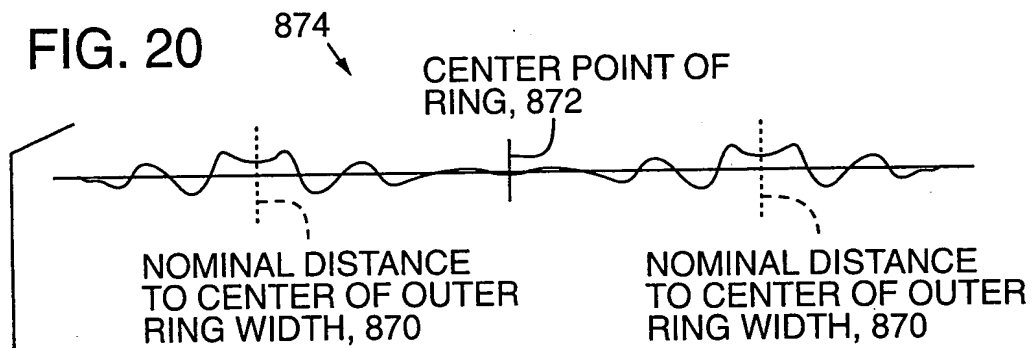


FIG. 19



QUEST FOR MOSALCED KNOT PATTERNS WHICH "COVER" AND
ARE COEXTENSIVE WITH ORIGINAL IMAGE;
ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME
INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A
NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 20



2-D BRIGHTNESS OF PHASE-ONLY FILTERED RING IS SIMILAR TO THE ABOVE BRIGHTNESS PATTERN ROTATED ABOUT CENTRAL POINT OF RING:

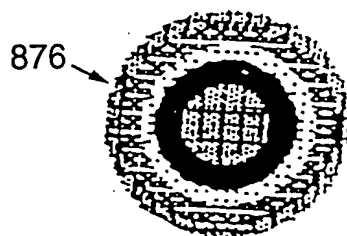


FIG. 21A

900 →

C	2C	C
2C	4C	2C
C	2C	C

WHERE $C = 1/16$

ELEMENTARY BUMP
(DEFINED GROUPING OF PIXELS WITH
WEIGHT VALUES)

FIG. 21B

...	2	3	4	5	6	7	0	...	
...	6	7	0	1	2	3	4	...	
...				C	2C	C		...	
...	2	3	4	2C	4C	2C	6	7	0
...				C	2C	C			
...	6	7	0	1	2	3	4		
...									

EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS $N=8$ WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

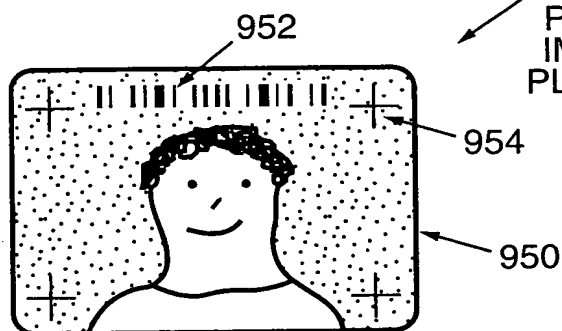
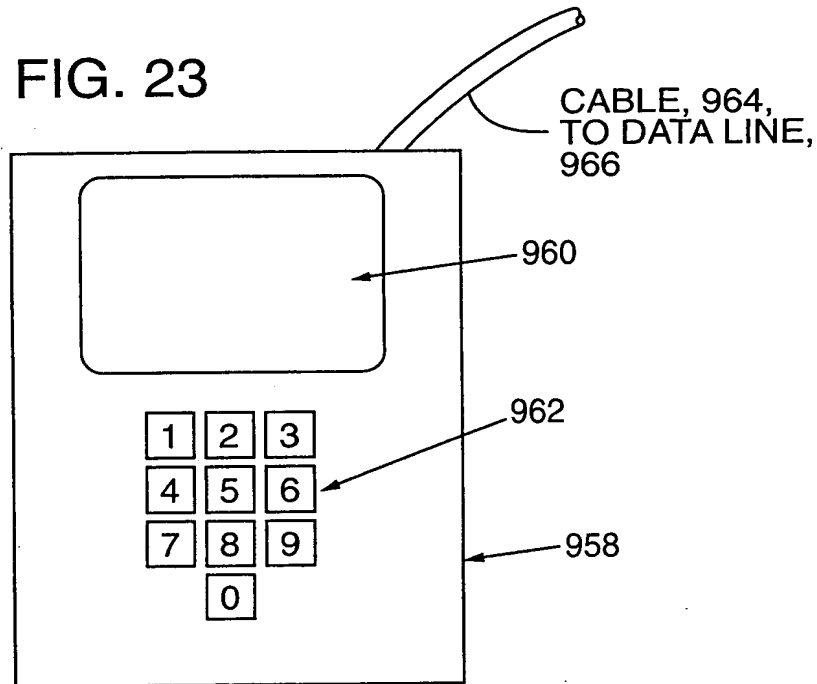


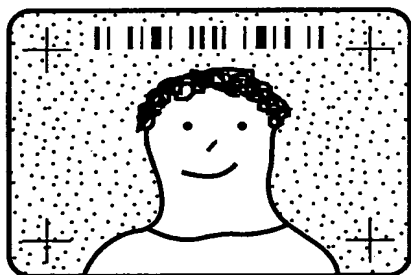
FIG. 23



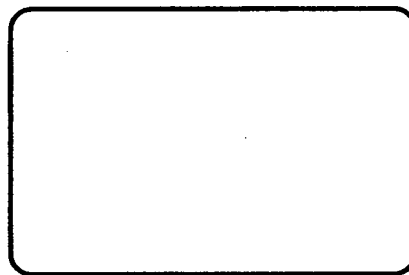
CONTAINS RUDIMENTARY OPTICAL SCANNER,
MEMORY BUFFERS, COMMUNICATIONS DEVICES,
AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW
AND CAN, AT THEIR PREARRANGED OPTION, EITHER
TYPE IN A PERSONAL IDENTIFICATION NUMBER
(PIN, FOR ADDED SECURITY) OR NOT. THE TRANSACTION
IS APPROVED OR DISAPPROVED WITHIN SECONDS.

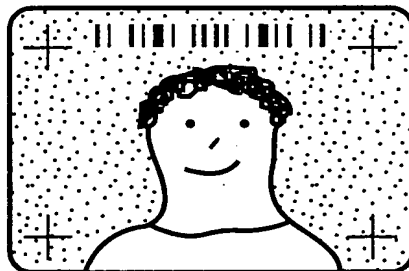
FIG. 24



ORIGINAL DIGITAL IMAGE WITH
BARCODE AND FIDUCIALS
ADDED, 970



COMPUTER GENERATES MASTER
SNOWY IMAGE 972, WHICH IS
GENERALLY ORTHOGONAL TO
ORIGINAL IMAGE AT LEFT

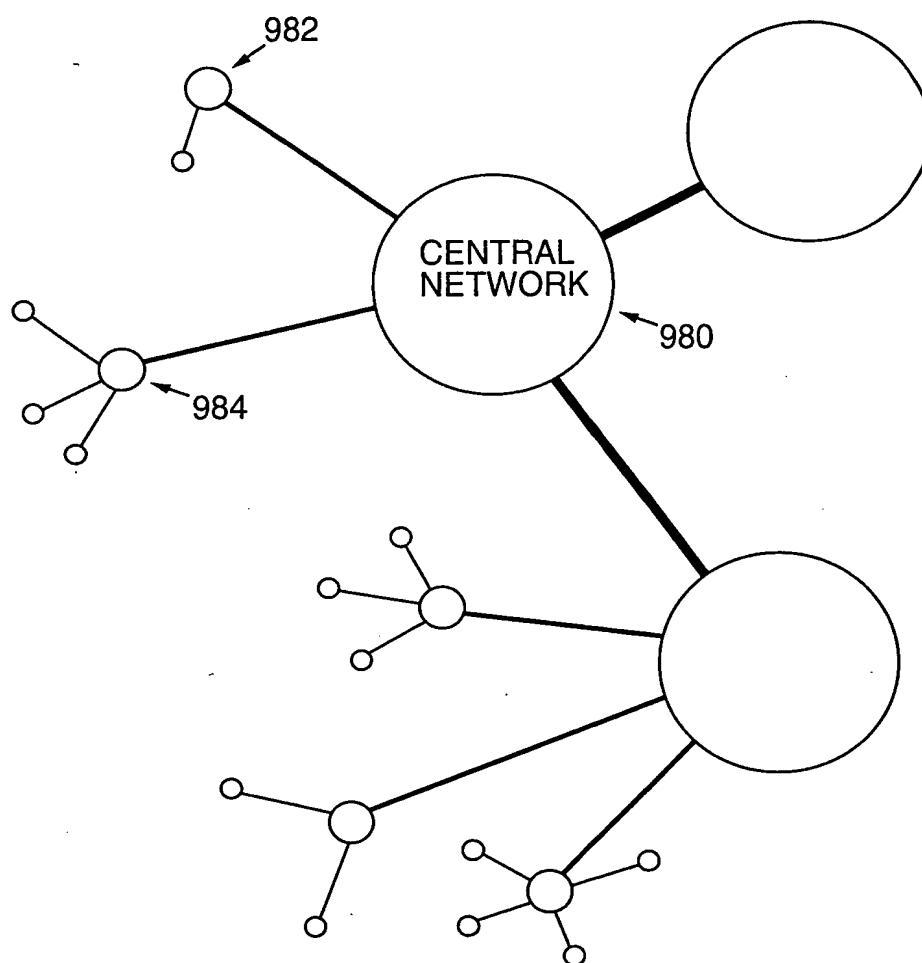


COMBINED TO FORM PERSONAL CASH CARD, 950

FIG. 25 TYPICAL TRANSACTION STEPS

1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSONS ID
2. OPTIONAL: USER KEYS IN PIN NUMBER
 3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
 4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
 5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
 6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
 7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
8. READER STEPS THROUGH THE TWENTY-FOUR SETS
 - 8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS
 - 8B. READER PERFORMS DOT PRODUCT OF RESULTANT PATTERN AND CARD SCAN, STORES RESULT
 9. READER TRANSMITS THE TWENTY-FOUR DOT PRODUCT RESULTS TO CENTRAL NETWORK
 10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER
 11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
 12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 26
THE NEGLIGIBLE-FRAUD CASH CARD SYSTEM



A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY

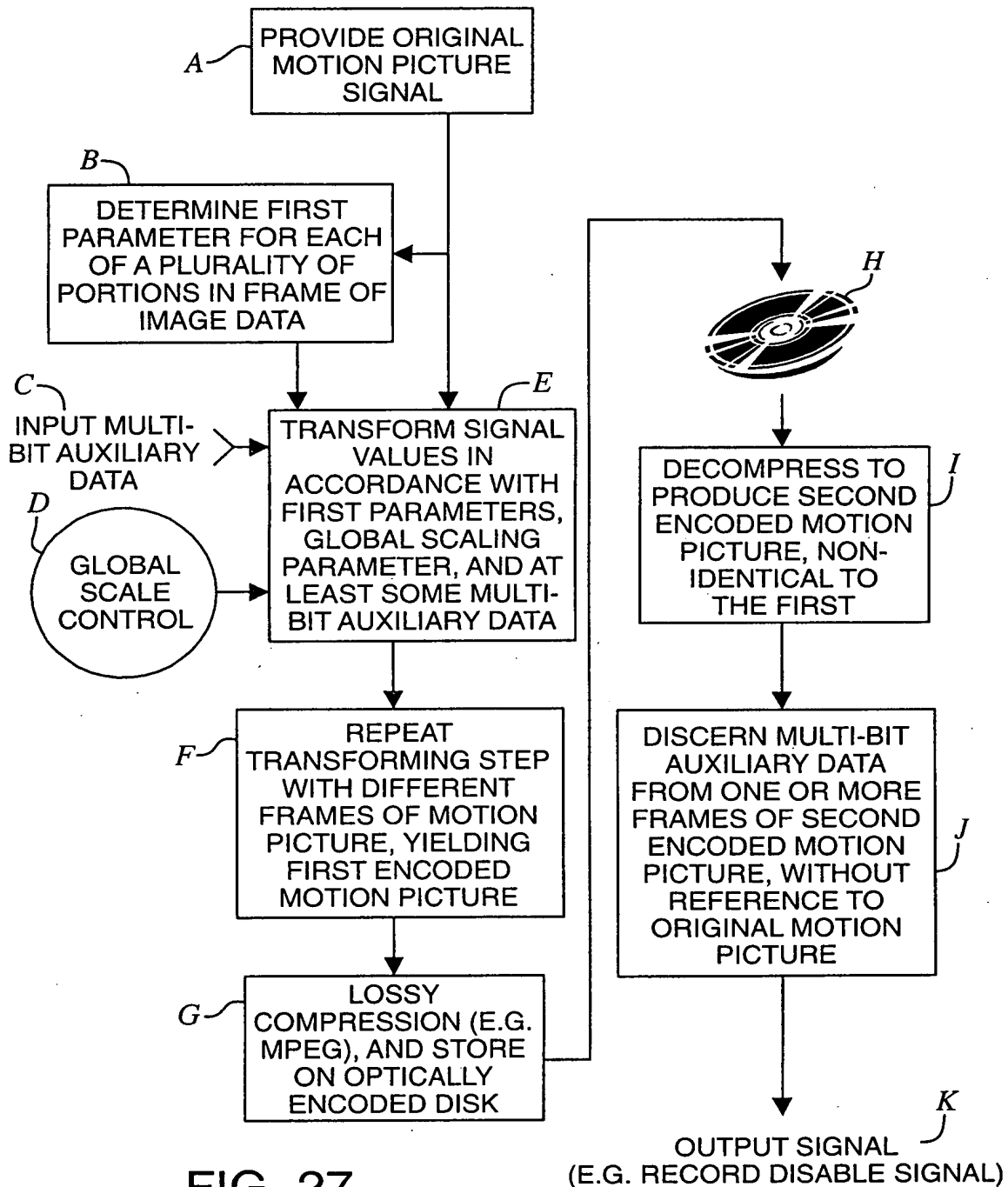


FIG. 27